Jennareddy Venkat Reddy Memorial Lecture

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Food for Mankind : From Cooperation or Competition ?

by

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About the Memorial Lecture.....

These lectures are in memory of the late Sri Jennareddy Venkat Reddy (1877-1936) - an outstanding and dedicated landowner and farmer of his times and a pioneer in many related fields in Warangal District. The lectures are meant to be delivered once every two years by an eminent agricultural scientist and set in motion new trends of thought in the areas of farm production and other agricultural problems.

These lectures are co-sponsored by and represent a cooperative arrangement between the A.P. Agricultural University, which hosts the lectures, the International Crops Research Institute for the Semi-Arid Tropics and the Farmers' Welfare Trust - a privately financed charitable trust devoted to the promotion of the cause of farmers, farm scientists and students of farm sciences.

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Food For Mankind : From Cooperation or Competition ?

Joseph H. Hulse

It is indeed a very great honour and privilege to present this lecture in memory of so distinguished and dedicated a person as the late Sri Jennareddy Venkat Reddy. For reasons to which I shall refer later, it is for me a distinction of immense personal significance and gratification.

> **"In the West... there has been a feverish rush in the realm of science for exploiting application of knowledge not so often for saving as for destruction. Some power of restraint, some complementary ideal there must be to save man from that mad rush which must end in disaster. He has followed the lure and excitement of insatiable ambition... He forgot that far more potent than competition is mutual help and cooperation in the scheme of life."**

This profound and prophetic statement was made in 1917 by Sri Jagdish Chandra Bose when he dedicated the Bose Institute to the Indian nation.

It is to the subject of mutual help and cooperation that this lecture is addressed.

In 1968, at the request of the World Bank, the Right Honorable Lester B. Pearson, former Prime Minister of Canada, formed a commission to study the future of international cooperation for economic development. The report of the Pearson Commission was entitled "Partners in Development". The major theme of the Pearson report was partnership and cooperation between what are designated "the developed" and "the less developed" nations; between the affluent minority composed of countries of North America, Europe and Oceania, and the less privileged majority: the nations of Africa, Asia, the Middle East and Latin America. Both the Pearson Commission and its successor, the Brandt Commission, which produced its report "North - South - A Program for Survival" in 1980, urged upon the wealtheir nations a more enlightened and liberal attitude towards the less privileged in terms of trade in agricultural commodities, in support for economic and technological development, in establishing and maintaining an internationally secure food supply.

*The Views expressed in this paper are those of the author and not necessarily of the International Development Research Centre.

Both Pearson and Brandt recommended much greater investment in food and agricultural research. The Brandt Commission gave special emphasis to regional cooperation — Cooperation among countries of Asia, Africa, Latin America and the Near East for their common benefit. Without in any manner discounting the critical importance of more extensive, enlightened and less restrictive cooperation between the nations of the North and those of the South, it is upon cooperation among nations of the South - the nations of Asia, Africa, the Middle East and Latin America that this discussion will concentrate.

India has a very special and vital role to play in international cooperation, philosophically, culturally, intellectually and technically. The Bhagavad Gita instructs us:

> **"There is no wisdom for man without harmony**
> **And without harmony there is no contemplation.**
> **Without contemplation there cannot be peace.**
> **And without peace can there be joy?"**

Mahatma Gandhi said: **"I don't wish to live in this world if it does not become united. If there is not the unity of the world on the basis of humanity, I do not wish to live in it."**

Dr. Radhakrishnan in his book "Our heritage" writes:

> **"All the living faiths of the world are to be found in India. We have Hindus, Muslims, Christians, Jews, Zoroastrians and many others. The Jews came to us when the temple of Jerusalem was destroyed in the first century A.D. The Christians came to us in the earlier centuries of the Christian era. The Zoroastrians came to us when Islam occupied Iran. And the Muslims came to us in the 7th and 8th Centuries A.D., and they have been here all these years. In India from whatever religion you come, you feel that you belong to one common family. This has been the tradition that has come down to us for the last 30 or 40 centuries. That is why we find in the same street in Bombay, a Mosque, a Christian Church, a Zoroastrian Temple and a Jewish synagogue, all existing in peaceful cooperation with each other."**

For many centuries Indian's devotion to scholarship has provided an example that all the world would do well to emulate. The Mahavihara, the post-graduate university for advanced study and research at Nalanda was one of the greatest

educational achievements of the ancient world. Its organizational structure, with its colleges of residence (Viharas) may well have been the model for the earliest European universities which appeared many centuries later. In the 7th Century A.D. at Nalanda there were 8,500 post-graduate students from Korea, Mongolia, Japan, China, Tibet and Ceylon, guided by more than 1,500 teachers. The comphehensive nature of the teaching at Nalanda is typical of what characterizes many notable Indian scholars of more recent times, men and women who are concerned with the sacred and the secular, with the philosophical and the practical, with both sciences and arts.

Bearing in mind the confrontations that have occurred in many of the world's universities in recent years, it is notable that Nalanda was unusually democratic in its management, the student population being given a significant share in the University's administration. As is the case with Indian scientists today, the scholars from Nalanda moved and settled widely across the known world taking up residence in China, Tibet, Ceylon and many other Asian countries as teachers and disciples of an elite intellectual disposition.

Of immense relevance to our world today and to the immediate future, is the exceptional contribution which Indian scholarship contributes to the technical, social and economic development of other nations. In sheer numbers, Indians are amongst the most highly educated people in the world. It is probably not too far from the truth to state that there are more professionally qualified Indians in the world than there are people in Canada.

Indians are playing a uniquely important role in agricultural research and development: politically, philosophically and practically. Immediately following independence the Government of India laid the foundations for, and subsequent governments have continually expanded the system of national research councils and research institutes that are unsurpassed in any other developing country, or, for that matter, in a great many so-called developed countries. The Central Food Technological Research Institute (CFTRI) in Mysore is the largest food research institute in the world. The integration of the Indian agricultural universities and colleges into the National Coordinated Production Improvement Programs finds few parallels elsewhere.

Over more than one-quarter of a century the Government of India has year by year continually and significantly increased

its investment in agricultural research. It is difficult if not impossible to determine exactly the financial return gained from investment in agricultural research: the number of rupees that result from each rupee invested in research activity. Nevertheless, several recent studies carried out by Indians and non-Indians come to the same conclusion: India's investment in agricultural research has been highly rewarding and it is doubtful if an equivalent investment in any alternative activity could have produced a comparable conomic and social benefit. Evenson and Jha (1973) estimated that the return to investment in Indian agriculture exceeded 50% per year. Karam Singh (1974) calculated returns to investment in agricultural research in the Punjab and estimated that the investment of 1 rupee in agricultural research gives a return of 27 rupees. Kahlon et.al (1973) came to the conclusion that in spite of the difficulties of calculating a precise relation between the cost invested and the benefit derived agricultural research in India has made a positive and substantial contribution. They estimate the marginal return on 1 rupee invested in agricultural research to range from about 14.3 rupees in Maharashtra to nearly 64 rupees in Bihar.

Most impressive and indisputable, however, is the ramrkable increase in total food grain production, the statistics of which are given in Table 1. I am convinced that if given equivalent encouragement and incentives, Indian scientists and farmers will achieve equally spectacular production increases in the millets, pulses, oilseeds and root crops as they have in the principal cereal grains. It is clearly important that they do so.

It is not unusual among people unfamiliar with Indian agriculture to attribute entirely the higher production of wheat and rice during the 1960s and 70s, to Indian farmers having planted the new "high yielding varieties" developed in the International Maize and Wheat Improvement Centre (CIMMYT) in Mexico and the International Rice Research Institute (IRRI) with its headquarters in the Philippines. While unquestionably these superior crop lines provided the essential raw material, the higher productivity would not have resulted without the high priority assigned to agricultural research and development by the Government of India, combined with the imaginative competence of Indian agricultural research scientists, and the shrewd, perceptive, industrious capability of Indian farmers, to one of whom this lecture is respectfully dedicated.

The notion, propagated by several ill-informed writers, that all of the benefits from the higher yields of wheat and rice have

been realized by large wealthy farmers, has been more than adequately refuted by my good friends Dr. M.S. Swaminathan, Professor C.F. Bentley and several others.

Professor Bentley (1978) presents convincing evidence to dispute the contention that the spectacular improvements in wheat and rice production have benefited only the large farmers to the disadvantage of smallholders. His data shows that India smallholders have increased their food grain production for both home consumption and sale, the latter giving them money with which to purchase the inputs required to achieve even higher productivity. They thus move from a downward to an upward economic spiral.

The Economist (1978) stated: **"The Indian peasant has shown himself both quick and discriminating in taking up new ideas. Use of fertilizer has gone up 11 times since 1960-61... As early as 1968-69 high yielding varieties of rabi paddy and of wheat were widely accepted by over 90 percent of farmers with 50 acres or more and by roughly half of those with 2 1/2 acreas or less."**

Indian agricultural productivity made more progress during the 30 years following independence than in the previous 7000 years.

Dr. Mellor (1976) Director of the International Food Policy Research Institute (IFPRI) stated that prior to 1947, India's annual growth rate in food grain production was 0.11 percent. Since 1950 it has averaged roughly 2.8 percent per year. M.S. Swaminathan (1980) points out that total food grain production at the start of the first Five-Year Plan was about 55 million tonnes. By 1978-79 it exceeded 130 million tonnes. Dr. Swaminathan also illustrates the dramtic increase in the rate of return on agricultural research investment since the coordinated production projects brought all State and Government research institutions into a cooperative partnership under the aegis of the Indian Council of Agricultural Research.

It is highly praiseworthy that in addition to all they have accomplished in food and agricultural research in India, so many Indian scientists are to be found in the service of other developing nations. One of the world's most eminent and able

scientists, Dr. M.S. Swaminathan is now the Director General of IRRI. Many other Indians hold senior positions among the family of International Agricultural Research Centres (IARCs). Dr. B.R. Sen was probably the most imaginatively creative of all the Directors General who have guided FAO and I believe he still serves as an advisor to that important United Nations agency.

If I may be permitted to introduce a personal note: it is because of the willingness of India to share its expertise in food science and technology with the other nations of Asia that I hold my present position. When, early in the 1960s, B.R. Sen devised and launched his world-wide Freedom From Hunger Campaign, the Canadian Freedom From Hunger Committee of which I was a member was invited to cooperate with the Government of India in establishing a training centre for Asian food scientists and technologists at the CFTRI in Mysore. The Canadian Committee accepted and I became Chairman of the Canada/Mysore project.

For Canadians this became a unique cooperative undertaking. Canadian food scientists and technologists from industries, government agencies and universities across the country, in cooperation with many voluntary agencies and in particular with Indians living in Canada, gave hundreds of lectures and demonstrations to explain to the general public the importance of food science and technology; the necessity of training people whose responsibility it is to ensure that food is safely preserved and delivered from the farm to the consumer, and from the regions and seasons of abundance to those scarcity.

The response from private citizens, industrial and voluntary organizations across Canada far exceeded the wildest expectations and made it possible for Canadians to cooperate with the scientists at Mysore in the project for more than a decade. During that period close to 800 scientists from almost every country in Asia came to what had been the Palace of the Maharaja to be trained by the resident Indian scientists in virtually all components of Asian post-harvest food technology. In addition, the University of Mysore awarded Master of Science degrees to students who successfully completed an intensive two-year training program at the Mysore Institute.

In 1976 the CFTRI became an associated institution of the United Nations University as a result of which the program of

training has been considerably expanded by adding fellowships, workshops and other activities to the established training courses. It is a happy circumstance that Dr. H.A.B. Parpia, who throughout the life of the Canada/Mysore project was the Director of CFTRI, is now the Coordinator of the United Nations University World Hunger Program of which the Mysore training centre is an important component.

To complete the personal note: as a consequence of our association in the Freedom From Hunger Campaign in 1966, Dr. Sen persuaded me to move from the Canadian food industry to his staff in FAO from where, some years later, I joined the International Development Research Centre (IDRC). Thus the proposal by Indians to cooperate with Canadians in the training of Asian scientists caused a total change of direction in my professional career.

One of the principal recommendations of the Pearson Commission was that investment in agricultural research be significantly increased in all developing regions of the world. Of particular concern to Mr. Pearson was the inadequate encouragement and support of what he called "indigenous research effort": enabling scientists in and of developing countries to carry out applied research on projects which they and their governments considered to be of high priority. The proposal to support indigenous research effort was motivated by what is all too familiar to Indian scientists and administrators: the tying of bilateral and multilateral assistance resources to the coat tails of "expatriate experts and advisers". No nation has tolerated more patiently than India the invasions of foreign experts, many of whom arrive and leave knowing infinitely less of relevance than those they presume to teach.

Mr. Pearson persuaded the Government of Canada to create the International Development Research Centre (IDRC) whose primary purpose is to support indigenous research effort in developing countries. The Government of Canada has provided almost all of the resources which IDRC has channeled into more than 1100 research projects in over 100 countries. The policy by which IDRC is guided and the manner in which the resources are disbursed is decided by an international board of 21 governors of which Mr. Pearson was the first Chairman. Though membership of the Board has changed over the Centre's 12 year history, at all times 10 members have come from countries other than Canada, six being from different countries of Asia, Africa, the Middle East and Latin America.

Two very distinguished Indians have been members of IDRC's Board. Mr. Anthony Dias who was Permanent Secretary of the Indian Food Ministry when the Canada/Mysore project was launched and later became Governor of West Bengal, was a member of IDRC's first Board. Dr. Y. Nayudamma, formerly Director General of the Council of Scientific and Industrial Research and now Vice-Chancellor of Jawaharlal Nehru University, is a member of the present Board of Governnors. At the invitation of President Giri and Prime Minister Indira Gandhi, the Board held its first meeting outside Canada in New Delhi in 1972.

At its first meeting the IDRC Board declared a high priority for agriculture, food and nutrition research and over its 12 year existence more than $100 million dollars has permitted cooperation with scientists in about 70 countries in research to improve systems of crop, animal, fisheries and forestry production and in post-production systems which embrace all that occurs between the time and place of harvest and the point of consumption.

It is a matter of particular concern that the scientists which IDRC supports are not left to work in isolation. It is demonstrable that the collective and individual agricultural economies of developing countries would benefit and progress more rapiddly if their scientists and technologists were enabled to share with one another their knowledge and experience and to cooperate for their common benefit. One means to this end has been to create networks of projects, each in a different country but pursuing a common interest. Where possible these networks are effectively linked to an international or regional research centre which supplies to the network improved agricultural materials and technologies for local adaptation, and equally important, training and information services.

One of the most successful networks was started by a two person research team working on one site in the Philippines in 1971. The Asian rice based cropping systems network is now a major component of Dr. Swaminathan's program at IRRI and includes several hundred Asian scientists working with rice farmers in over 100 communities in 12 Asian countries. This program has enabled many smallholders to make more effective use of the rice cultivars that mature more rapidly than the traditional varieties, to expand the number of other food and cash crops that can be grown in association with rice, and to help farmers to make optimum and most effective use of their limi-

ted resources. Equally important, by enabling all of the Asian agricultural research scientists involved to meet at least once every year, each time in a different country, a more efficient methodology for on-farm cropping systems research has evolved and is being constantly refined.

IDRC's Division of Agriculture, Food and Nutrition Sciences has cooperated in more than 20 projects with research institutes in India, plus several administered by ICRISAT in India, Africa and Latin America. We were privileged to be associated with ICRISAT from its earliest beginnings having taken part in the Mission led by Dr. Cummings and in the team which laid the basis for ICRISAT's program in Africa. For a period of three years an IDRC staff scientist, Dr. Hugh Doggett, was seconded to ICRISAT to set the sorghum research program in motion.

The results of projects directed and conducted entirely by Indian scientists in cooperation with IDRC are bringing benefit not only to India but to many other developing countries. Triticale is the first man-made intergeneric cereal hybrid to have progressed beyond the status of an academic curiosity. Scientists at G.B. Pant University were among the first to demonstrate that in the Himalayas triticale could survive and set seed at high altitudes and low temperatures intolerable to most other cereals.

Because there is no international agricultural research centre responsible for improvement of the minor millets, the research coordinated by ICAR on these cereal grains is of international importance. The five minor millets and the different locations at which each are being studied are:

Kodo (*Paspalum scrobiculatum*) – Dindori (Madhya Pradesh)
Foxtail (*Setaria italica*) – Nandyal (Andhra Pradesh)
Little (*Panicum miliare*) – Jeypore (Orissa)
Common (*Panicum miliaceum*) – Kanke (Bihar)
Barnyard (*Echinochloa frumentacea*) – Almora (Uttar Pradesh)

It is hoped that each of these centres will bring together what may be regarded as an international germplasm collection. Already a cooperative arrangement has been established between three of these Indian centres and scientists in Bangladesh to encourage the exchange of breeding material and technical information.

It was Governor Dias who drew IDRC's attention to the millions of dollars in foreign currency which India and several other Asian nations pour out to import edible vegetable oils. With the exception of ICRISAT's groundnut program, there is no international centre responsible for vegetable oilseed improvement and therefore since 1975, under ICAR's administrative coordination, rapeseed (*Brassica campestris*) is being improved at G.B. Pant University in Uttar Pradesh, mustard (*Brassica juncea*) at Haryana Agricultural University, safflower (*Carthamus tinctorius*) at the India College of Agriculture in Madhya Pradesh, and sesame (*Sesamum indicum*) at Vriddachalam.

In each project the objectives are to increase yield of seed, percentage oil content and to breed and select for resistance to the various well known pests and diseases. The scientists at Vriddachalam have identified in their sesame collection hybrids that yield 800 kg/ha in an 80-day duration and others that produce an oil content close to 50 percent by weight of grain. The average yield for sesame throughout India is less than 200 kg/ha (Table 1).

This important Indian research has been linked to other oilseeds improvement projects in Egypt, the Sudan, Ethiopia and several other countries. By stimulating cooperation on the same oilseed crops at several different locations, the total germplasm collection becomes representative of types adapted to a wide range of latitudes, day lengths and agroclimatic conditions. Through the network the scientists gain access to this diverse germplasm collection and, as with the Asian cropping systems network, are given the opportunity to meet at least once each year and to share their results and experience each with the others.

One of the most spectacular advances in fish farming, or aquaculture as it has come to be called, originated at the Central Inland Fisheries Research Institute (CIFRI) at Barrackpore. Traditionally, the world over, aquaculture has been confined to monoculture, the cultivation of only one fish species at a time. The scientists at Barrackpore demonstrated the feasibility of polyculture (or composite culture) in which, in the same body of water, five or six different species each with a different feeding habit can be raised simultaneously.

Briefly, the polyculture system begins by clearing the village pond by dispersing an oilseed cake which contains a toxic alkaloid called "mowrin". This kills off all existing fish, snails

Table 1
INDIAN AGRICULTURE SELECTED MAJOR CROPS

CHANGES IN PRODUCTION, YIELD, AND AREA UNDER CULTIVATION 1961-65 TO 1979/80
(Data from FAO: World Agricultural Production Yearbooks)

Production (x1000Mt) Yield (Kg/ha) Area (x1000ha)		CEREALS					PULSES	OILSEEDS			Roots & Tubers
		Wheat	Rice (paddy)	Sorghum	Millet	Maize	Total Pulses	Ground-nuts	Rape & Mustard	Sesame	Cassav
1961-65	Production	11,191	52,700	8,848	7,728	4,593	11,700	5,125	1,277	442	2,95
	Yield	835	1,480	487	415	992	487	709	422	181	9,035
	Area	13,402	35,626	18,155	18,638	4,630	24,004	7,226	3,027	2,442	254
1973-74	Production	21,778	59,368	10,414	7,021	5,559	9,506	5,111	1,704	392	6,421
	Yield	1,172	1,567	643	385	948	411	724	493	176	17,439
	Area	18,583	37,888	16,189	18,215	5,863	23,134	7,063	3,456	2,234	368
1979-80	Production	31,564	63,611	11,320	8,216	5,578	9,949	5,772	1,433	371	6,053
	Yield	1,437	1,632	688	476	970	437	797	412	155	16,748
	Area	21,964	38,947	16,449	17,272	5,752	22,789	7,238	3,475	2,384	361
% change	Production	182	20	27	6	21	(–14)	12	12	(–16)	163
1961-65	Yield	72	10	41	15	(–2)	(–10)	12	(–2)	(–14)	85
to 1979-80	Area	63	9	(–9)	(–7)	24	(–5)	0	15	(–2)	42

and other undersirable aquatic species but after 10 days the toxic alkaloid is biologically degraded to harmless substances. The pond can then be stocked with the juveniles of as many as six different species of carp, each with a different feeding habit. Each pond is regularly fertilized with cow manure and inorganic phosphate to stimulate phytoplankton growth. Cut grass, inedible cuttings from vegetables and rice bran are mixed and floated in baskets on the surface of the pond. The grass carp soon learn to feed from these floating lunch baskets. When the polyculture system was introduced into villages in West Bengal and Orissa annual yields of fish increased from less than half a tonne per surface hectare to as much as six tonnes in several villages. I understand that the system is now being demonstrated in other states of the nation by the State Fisheries Extension Services. The technology has been widely publicized in other countries of Asia, the Middle East and Latin America where with IDRC's support, the methodology of polyculture is being modified to suite a variety of aquatic conditions and fish species. Just one more example of the manner in which Indian science can benefit other countries of the developing world.

From the time the Consultative Group on International Agriculture Research (CGIAR) was created in 1971, international investment in research to increase crop and animal production has grown significantly. It is hoped that support for ICRISAT and other members of the CGIAR family will continue to expand. Though the present levels of investment in production research are less than what is desirable, nothing comparable has been invested in research or development to improve the post-harvest systems for cereals, oilseeds or legumes. It is therefore noteworthy that ICAR is coordinating a post-harvest research program covering all of the major food crops of India. As is the case with the millets and oilseeds production projects, each of several agricultural colleges and research stations is responsible for the post-harvest aspects of crops of local importance.

The Central Institute of Agricultural Engineering at Bhopal is concentrating upon the storage and milling of wheat and bengal gram using cleaned, discarded coal tar drums. A small one horse power burr mill produces wheat flour, bengal gram dhal and coriander powder more cheaply than larger commercial mills. These small Indian mills are soon to be tested in several villages.

At Punjabrao Krishi Vidyapeeth at Akola in Maharashtra a jowar (sorghum) dryer, fuelled by agricultural wastes, and lined bamboo storage bins have been developed for village use. At TNAU in Coimbatore several groundnut diggers, strippers and decorticators, as well as a maize dehusker/sheller have been developed and commercially manufactured. At the Central Rice Research Institute at Cuttack, Orissa, new techniques for drying, storing and parboiling rice are being tested by the rural communities. The University of Udaipur in Rajasthan is working on the post-harvest technologies for bajra (pearl millet), bengal gram and sesame.

This is a very important program of work in that it covers almost all the important food grains and oilseeds grown in India, which in turn are representative of most of the grains grown throughout the tropical and subtropical countries of Asia, Africa and the Middle East. The program is not only producing results, but providing a model program from which many other countries may derive benefit.

The exceptional contributions made by Indian scientists to international agricultural research and rural development are too numerous to be mentioned in a paper such as this. I would, however, like to mention the name of one scientist at the Andhra Pradesh Agricultural University, and that is Dr. Pushpamma, Dean of the College of Home Science. IDRC has cooperated in rural research projects in more than 70 countries. I can think of no scientists in any of these countries who have devoted themselves more effectively than Dr. Pushpamma to improving the welfare of rural women and the nutritional well-being of rural communities. Her work stands as a model of dedication, practical common sense and scientific integrity. It has indeed been a privilege for IDRC to cooperate with her.

No realm of human endeavour offers greater opportunity for international cooperation than the common purpose of providing all mankind with food sufficient for their needs. That goal will be reached only if nations are prepared to tread the path together in harmonious cooperation; when they all accept B.R. Sen's dictum that "one man's hunger is every man's hunger".

To accelerate cooperation towards this common goal of a universal freedom from hunger, the International Council of Scientific Unions (ICSU) recently created an international Commission on the Application of Science to Agriculture, Forestry

and Aquaculture (CASAFA). It is inviting all the national academies of science which are members of ICSU to create national CASAFA committees in order to bring about a greater degree of cooperation among the practitioners of pure and applied science and technology throughout the world. The Indian National Science Academy was the first to establish a national committee to promote this new modality of scientific cooperation.

As M.S. Swaminathan (1979) points out in his paper on global food security, the theoretical capacity of the world to produce food grains is about 39 times the present global production. The greatest untapped production potential lies in Asia followed by Latin America and Africa. Dr. Swaminathan illustrates the encouraging opportunities which exist for significantly greater food production on the Indian sub-continent. As he states: "The gap between potential and actual yields is very wide in most farming systems (in India)". Remembering the spectacular results during the mid-1970's when India's annual wheat production rapidly increased from 12 million tonnes to 28 million tonnes, one can look forward to equally noteworthy agricultural advances in the future.

As they progress in satisfying the dietary needs of their own people, Indian scientists and farmers can provide exemplary guidance and cooperative assistance to many other developing countries. India spans nearly 28 degrees of latitude and, within its boundaries embraces a remarkable diversity of agroclimatic conditions. No nation produces a greater variety of food grains for internal consumption. No developing nation graduates more professionally qualified scientists. Equally, perhaps more important, is the Indian philosophy of Antyodaya: concern for the poorest of the poor, a philosophy so eloquently advocated by Mahatma Gandhi, but so sadly ignored by politicians in many other countries.

Dr. Radhakrishnan's book "The Hindu Way of Life" ends with the sentence: "Those who light a little candle in the darkness will help to make the whole sky aflame."

Indian philosophers, scholars and scientists have lit many candles by which to enlighten mankind in pursuit of a more just and equitable society of nations. India can make the international sky aflame with a new light of knowledge and understanding. India, if it so wishes, can generate the flash of

enlightenment needed to persuade all developing nations that it is through cooperation not competition that mankind will be adequately fed in a world united and at peace; a world in which Mahatma Gandhi would be content to live.

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In 1970 he was Special Adviser to the Secretary General of the United Nations, U. Thant, on World Protein Resources. Between 1962 and 1966 he was Chairman of the Canadian Freedom from Hunger Committee and Chairman of the Canada/Mysore project. He is a past-member of the United Nation's Protein Calorie Advisory Group and has been a member of the World Bank's Consultative Group on International Agricultural Research since its inaugural meeting in 1971.

In 1978 he received the U.S. Institute of Food Technology's International Award. He is an Honorary Fellow of the University of Manchester's Institute of Science and Technology (UMIST) and an Honorary Fellow of both the Australian and the New Zealand Institutes of Food Science and Technology. In 1980 he was graduated a Doctor of Science by the University of Guelph.

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